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EXAMINER

MORILLO, JANEL COMBS

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**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Application Number: 09/740,708
Filing Date: December 19, 2000
Appellant(s): CHANDLEY ET AL.

Kathryn A. Marra
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed April 23, 2004.

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Pursuant to the Remand under 37 CFR 1.193(b)(1) by the Board of Patent Appeals and Interferences on March 25, 2005, a supplemental Examiner's Answer is set forth below. The "Prior Art of Record" section has been added. Additionally, the Nazmy patent US 5,286,443 (see "Notice of References Cited" 6/25/2002) was corrected in the below rejection to refer to US 5,286,443 instead of 5,286,442.

(1) *Real Party in Interest*

A statement identifying the real party in interest is contained in the brief.

(2) *Related Appeals and Interferences*

A statement identifying the related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief.

(3) *Status of Claims*

The statement of the status of the claims contained in the brief is correct.

(4) *Status of Amendments After Final*

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) *Summary of Invention*

The summary of invention contained in the brief is correct.

(6) *Issues*

The appellant's statement of the issues in the brief is correct.

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(7) Grouping of Claims

Appellant's brief includes a statement that claims 10-24 do not stand or fall together and provides reasons as set forth in 37 CFR 1.192(c)(7) and (c)(8).

(8) Claims Appealed

The copy of the appealed claims contained in the Appendix to the brief is correct.

(9) Prior Art of Record

US 5,286,443	Nazmy et al.	2-1994
US 6,443,212	Choudhury et al.	09-2002
US 6,283,195	Chandley et al	9-2001
WO 00/45973 A1	Chandley et al	8-2000

(10) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 10-15 and 21-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over WO 00/45973 (WO'973) in view of Nazmy et al (US 5,286,443 A).

WO'973 teaches a process of using a titanium aluminide machine components (such as hot sleeves, plungers, dies, extrusion dies, holders for filters in permanent mold casting, page 2 lines 12-16) or mixing blades (page 2 line 10) for contacting molten aluminum (page 2 lines 6-7). WO'973 teaches the use of a predominately gamma phase Ti-Al alloy typically 30-35wt% Al and 55-65wt% Ti (page 6 lines 18-23). WO'973 teaches that said Ti-Al alloy machine component or mixer blade can be oxidized to provide a surface oxide film by heating to a temperature $\geq 800^{\circ}\text{F}$ ($\geq 427^{\circ}\text{C}$), followed by cooling in air (page 5 lines 22-34), wherein said oxide layer renders the Ti-Al alloy non-reactive with the molten aluminum (page 6 lines 13-15) and increases the service life (page 7 lines 17-23). WO'973 teaches the particular Ti-Al alloy composition is selected "depending on particular temperatures and stresses to be encountered in service" (page 6 lines 24-25).

Concerning independent claims 10 and 21, WO'973 does not teach the use of a Ti-Al alloy including a rare earth element in an effective amount to prolong resistance to attack of the alloy by the molten material, as presently claimed. However, Nazmy teaches gamma phase Ti-Al alloys intended for machine components (abstract), and teaches that certain alloying additions (such as Yttrium) provide for excellent hardness and strength at high temperatures (column 15 lines 25-54, Exemplary embodiment 54 and 56, Fig. 7), enabling the field of application of the modified Ti-Al alloys to be extended to temperatures between 600-1000°C (column 14 lines 52-54). As stated above, the primary reference of WO'973 teaches the particular Ti-Al alloy composition used for contacting molten aluminum is selected "depending on particular temperatures and stresses to be encountered in service" (page 6 lines 24-25). It would have been obvious to add Yttrium to the Ti-Al alloy taught by WO'973 (wherein the Ti-Al alloy is in the

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form of a mixing blade, etc. useful for contacting molten aluminum, WO'973 at page 2 lines 6-7), because Nazmy teaches that adding a rare earth metal such as Yttrium to a gamma phase Ti-Al alloy provides for excellent hardness and strength at high temperatures, enabling the field of application of the modified Ti-Al alloys to be extended to temperatures up to 1000°C (Fig. 3 and Fig. 7 examples 21 and 23, see column 3 lines 43, 47, column 4 lines 32-34).

Motivation to select Y

Nazmy teaches example alloys 14 (50at% Ti, 2 at%Y, 48at% Al), 15 (49at% Ti, 3 at%Y, 48at% Al), 21 (48.5at% Ti, 3 at%Y, 48at% Al, 0.5at% B), and 23 (48.5at% Ti, 3 at%Y, 48at% Al, 0.5at% Ge) that fall with the scope of the instant claim, and Fig. 2, Fig. 3, and Fig. 7 show that Yttrium provides for excellent hardness and strength at high temperatures. In fact, Nazmy teaches strong motivation to select Y from the markush group named in the abstract- namely, Nazmy teaches that adding Y has the strongest effect on increasing hardness and strength (column 14 lines 25-28).

Prolong resistance to attack

Increasing the high temperature strength by adding Y (as taught by Nazmy) to the Ti-Al alloy taught by WO'973 would "prolong resistance to attack of the alloy by molten aluminum" because said alloy has greatly increased heat resistance/high temperature strength (see Nazmy Fig. 7) at temperatures where Al is in the molten state (instant specification page 4 line 18 mentions molten aluminum at 700°C). In other words, a Ti-Al alloy with low heat resistance (low strength at high temperatures, such as the Ti-Al alloys without Y additions, see examples #1 or #2 in Nazmy Fig. 7, column 3 line 25) would be thermally, mechanically, etc. damaged/attacked (during the die casting, molding, mechanically mixing process taught by

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WO'973 at p 1-2) by high temperature molten aluminum before an alloy with high heat resistance (high strength at high temperatures, such as the Ti-Al alloys with added Y, see alloy #21 or #23 Fig. 7), within the scope of the presently claimed "prolong".

Dependent claims

Concerning dependent claim 11, as stated above, WO'973 teaches the use of a gamma phase Ti-Al alloy.

Concerning dependent claim 12, and 22-24, as stated above, Nazmy teaches example alloy 14 (50at% Ti, 2 at%Y, 48at% Al is equivalent to 61.9wt%, 4.6wt% Y, 33.5wt% Al) which falls within the scope of the instant claims. It would have been obvious to add Yttrium to the Ti-Al alloy taught by WO'973, because Nazmy teaches that adding a rare earth metal such as Yttrium to a gamma phase Ti-Al alloy provides for excellent hardness and strength at high temperatures (column 15 lines 25-54).

Concerning dependent claims 13-15, as stated above, WO'973 teaches the formation of a surface oxide formed in-situ by contacting with an oxygen bearing atmosphere at elevated temperature (page 2 lines 2-7). More specifically, WO'973 teaches that said Ti-Al alloy machine component or mixer blade can be oxidized to provide a surface oxide film by cooling the hot casting in air or reheating to above 800°F in air (page 5 lines 22-34), wherein said oxide layer renders the Ti-Al alloy non-reactive with the molten aluminum (page 6 lines 13-15).

3. Claims 16-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over WO 00/45973 (WO'973) in view of Nazmy et al (US 5,286,443 A) and Choudhury (US 6,443,212 B1).

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Independent claim 16 mentions steps of prolonging the resistance of a Ti-Al alloy to a molten material comprising aluminum by a process comprising: a) contacting, b) removing, c) cleaning, d) heating, and e) re-contacting. The examiner points out that WO'973 teaches a process of casting comprising the steps of: a) contacting molten aluminum into the Ti-Al shot sleeve between the Ti-Al die halves (page 7 lines 25-30), b) removing said die cast aluminum article (page 7 line 31), and e) re-contacting with additional molten aluminum (page 7 line 17). WO'973 also teaches d) heating an Ti-Al alloy to a temperature $\geq 800^{\circ}\text{F}$ ($\geq 427^{\circ}\text{C}$) in air atmosphere to form an in-situ oxide film (page 2 line 9, page 5 lines 24-25), followed by cooling in air (page 5 lines 22-34), wherein said oxide layer renders the Ti-Al alloy non-reactive with the molten aluminum (page 6 lines 13-15) and greatly increases the service life (see column 7 lines 17-23, an improvement of 500-600% in service life was achieved by said oxide layer, see also page 8 lines 10-12). WO'973 does not specify step c), cleaning the alloy to remove molten material.

Concerning step c), Choudhury teaches that it is conventional in the metallurgical casting art to inspect and clean the surfaces of mold cavities when said (empty) cavities are open and accessible for inspection and cleaning (column 7 lines 3-4). It would have been obvious to one of ordinary skill in the art to clean (as taught by Choudhury) the TiAl die halves (WO'973 page 7 lines 30-31) with added RE metal taught by WO'973 and Nazmy, after step b) of removing the alloy product, because Choudhury teaches that such cleaning and inspecting are done as necessary when said (empty) cavities are open and accessible for inspection and cleaning (column 7 lines 3-4).

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Concerning dependent claim 17, as stated above, WO'973 teaches heating the alloy in an oxygen atmosphere in order to form in-situ oxide coating (page 2 line 9, page 5 lines 24-25). Said heating step is done prior to first contacting the Ti-Al alloy with the molten material (page 5 lines 24-25).

Concerning claims 18-20, WO'973 does not teach the use of a Ti-Al alloy including a rare earth element in an effective amount to prolong resistance to attack of the alloy by the molten material. However, as stated above, Nazmy teaches gamma phase Ti-Al alloys intended for machine components (abstract), and teaches that the addition of Yttrium provides for excellent hardness and strength at high temperatures (column 15 lines 25-54, Exemplary embodiment 54 and 56). It would have been obvious to add Yttrium to the Ti-Al alloy taught by WO'973, because Nazmy teaches that adding a rare earth metal such as Yttrium to a gamma phase Ti-Al alloy provides for excellent hardness and strength at high temperatures (column 15 lines 25-54), thereby resulting in prolonged resistance to damage/attack (see also sections above labeled "Prolong resistance to attack" and "Motivation to select Y").

Concerning claim 19, WO'973 does teach said Ti-Al alloy is a predominately gamma phase Ti-Al alloy (page 6 lines 18-23).

Double Patenting

4. Claims 10-15 and 21-24 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-14 of U.S. Patent No. 6,283,195 B1 (hereinafter US'195) in view of Nazmy et al (US 5,286,443 A). The claims of US'195 teach a method of contacting molten aluminum with tooling (such as a mixer blade, US'195 claim 2, or a

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die for die casting, US'195 claim 5) made from passivated Ti-Al alloy (predominately gamma, see US'195 claim 2) with a surface oxide film (US'195 claim 1) wherein said oxide film is formed in-situ by contact at elevated temperature with an oxygen bearing atmosphere.

The claims of US'195 do not teach the use of a Ti-Al alloy including a rare earth element in an effective amount to prolong resistance to attack of the alloy by the molten material, as presently claimed. However, as stated above, Nazmy teaches gamma phase Ti-Al alloys intended for machine components (abstract), and teaches that certain alloying additions (such as Yttrium) provide for excellent hardness and strength at high temperatures (column 15 lines 25-54, Exemplary embodiment 54 and 56), enabling the field of application of the modified Ti-Al alloys to be extended to temperatures between 600-1000°C (column 14 lines 52-54). Nazmy teaches example alloy 14 (50at% Ti, 2 at%Y, 48at% Al is equivalent to 61.9wt%, 4.6wt% Y, 33.5wt% Al).

It would have been obvious to add Yttrium to the Ti-Al alloy taught by the claims of US'195, because Nazmy teaches that adding a rare earth metal such as Yttrium to a gamma phase Ti-Al alloy provides for excellent hardness and strength at high temperatures (Nazmy at column 15 lines 25-54).

5. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

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Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

(11) Response to Argument

Appellant's argument that the present invention is allowable over the prior art of record because the prior art teaches an alloy composition but not a method of increasing the service life (arguments page 7 1st paragraph) or because the prior art does not teach the presently claimed method claims (arguments page 10 lines 1-10) has not been found persuasive. The prior art does teach a Ti-Al alloy with added Y, while the instant invention is drawn to a method of increasing the service life of an alloy, however, by making the Ti-Al with added Y as taught by the prior art, one inherently meets the presently claimed method of "increasing the service life" as well as "prolong resistance to attack" - in view of alloying a Ti-Al alloy with Y (see rejections above for details).

The argument that the prior art does not teach or provide motivation to add a rare earth element to TiAl alloy in order to prolong the resistance to attack by molten aluminum (page 7 2nd full paragraph, page 8 2nd full paragraph), has not been found persuasive. Nazmy teaches (see examples 21 and 23) that TiAl alloys with added Yttrium (a rare earth element) maintain excellent strength and hardness at very high temperatures (>> than the melting point of molten aluminum). Fig. 7 of Nazmy shows that alloys 21 and 23 exhibit a LARGE improvement in strength over TiAl alloys with no additions (alloys 1 and 2). Clearly, there is strong motivation to add a rare earth element to TiAl alloys in order to improve high temperature strength for TiAl alloy machine components intended for contacting molten aluminum, and wherein said addition

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would necessarily prolong resistance to attack (WO'973 page 2 lines 6-7). See also above section labeled "Prolong resistance to attack".

Appellant's argument (arguments p 7, 3rd full paragraph- middle of page 8) that the mechanical property data of the TiAl alloy with added Y (presumably tests conducted in air) given by Nazmy cannot be used to predict the temperature resistance of a TiAl alloy with added Y contacted with molten aluminum has not been found persuasive. Both WO'973 and Nazmy are drawn to the field of high temperature TiAl alloys intended for machine components (Nazmy at abstract, WO'973 at abstract), wherein WO'973 teaches machine components such as mixing blades (page 2 line 10) for contacting molten aluminum (page 2 lines 6-7). Furthermore, Nazmy teaches the addition of said Yttrium enables the field of application (which is machine components) of the modified Ti-Al alloys to be extended to temperatures between 600-1000°C (column 14 lines 52-54). One of skill in the art would therefore be motivated to use said high strength TiAl alloy with added Y for various machine components, including mixing blades for contacting with molten aluminum, as taught by the main reference WO'973, due to the DRAMATIC increase in strength at high temperature taught by Nazmy (see Nazmy Fig. 7, etc.).

The argument that appellant has shown unexpected results (arguments pages 8-9) has not been found persuasive. As stated above, said results are not unexpected, but rather expected, due to the DRAMATIC increase of high temperature heat resistance resulting from the addition of Y to a Ti-Al alloy (see above rejection). Additionally, appellant's "reliance on examples in the specification disclosures as showing unexpectedly superior results is misplaced, since examples are manifestly not designed to compare, and do not compare, claimed subject matter with closest prior art" Ex parte Beck, 9 USPQ2d 2000 (BPAI, 1987). The combination of WO'973 and

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Nazmy teaches adding a rare earth element in an effective amount to “prolong” resistance to attack of the alloy. Appellant has not shown unexpected resistance to attack with respect to the closest prior art of WO’973 and Nazmy.

The argument that there is no motivation to select Y from the group of elements listed in Nazmy (arguments page 10) has not been found persuasive. Nazmy teaches examples with added Y (see alloy 21 and 23), and graphs that show that adding Yttrium to a gamma phase Ti-Al alloy provides for excellent hardness and strength at high temperatures (Fig. 3 and Fig. 7 examples 21 and 23, see column 3 lines 43, 47, column 4 lines 32-34). In fact, Nazmy teaches strong motivation to select Y from the markush group named in the abstract- namely, Nazmy teaches that adding Y has the strongest effect on increasing hardness and strength (column 14 lines 25-28). See also section labeled “Motivation to select Y”.

The argument that the prior art does not meet instant claim 16 because Choudhury does not teach TiAl alloy molds (arguments page 11, 12, and 13) has not been found persuasive. Appellant argues that Choudhury teaches at column 1 lines 20-26 molten TiAl metals and alloys to be melted and cast in molds. The examiner agrees that Choudhury does not mention TiAl molds. Even so, Choudhury teaches that it is conventional in the art of casting metal alloys to inspect and clean the surfaces of mold cavities when said (empty) cavities are open and accessible for inspection and cleaning (Choudhury at column 7 lines 3-4). It would have been obvious to one of ordinary skill in the art to clean (as taught by Choudhury) the TiAl die halves (WO’973 page 7 lines 30-31) with added RE metal taught by WO’973 and Nazmy, after step b) of removing the alloy product, because Choudhury teaches that such cleaning and inspecting are done as necessary when said (empty) cavities are open and accessible for inspection and cleaning

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(column 7 lines 3-4). It is within the level of one of ordinary skill in the art to apply the cleaning step taught by Choudhury to a variety of casting molds used to cast molten metal, such as the Ti-Al-Y casting mold with an oxide film used to cast molten aluminum (as taught by the combination of WO'973 and Nazmy, see above rejection).

Appellant's argument that the present invention is allowable over the prior art of record because the prior art does not teach certain steps set forth in claims 16-20 (arguments p 11-12) has not been found persuasive. In the above rejection, the examiner has clearly set forth the steps mentioned by instant claim 16 vs. the teachings of the prior art. In response to appellant's argument concerning the heating step of claim 16, the examiner no longer argues that the temperature of molten aluminum would be sufficient to reform an oxide surface film, but that WO'973 teaches a step of heating an Ti-Al alloy to a temperature $\geq 800^{\circ}\text{F}$ ($\geq 427^{\circ}\text{C}$) in an oxygen containing atmosphere (air) to form an in-situ oxide film (page 2 line 9, page 5 lines 24-25), which meets the presently claimed limitation of "heating the alloy in an oxygen-bearing atmosphere at elevated superambient temperature to form a surface oxide thereon". The combination of WO'973 and Nazmy teach the presently claimed method of prolonging resistance wherein said method comprises: contacting, removing, heating, and re-contacting. The step of cleaning is taught by Choudbury, and is properly combined for the above mentioned reasons.

Concerning the obviousness-type double patenting rejection, the examiner agrees that the US'195 patent corresponds to the WO'973 document. The combination of the claims of US'195 and Nazmy teach a method of prolonging resistance or die casting substantially as presently claimed (see complete rejection above). For the above reasons, it is believed that the rejections should be sustained.

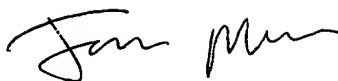
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Respectfully submitted,


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April 12, 2005

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